

Appendix 1: Traffic Study

Prepared by TetraTech Rizzo

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Traffic Study
Lexington Technology Park
Lexington, Massachusetts

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Executive Summary

This study analyzes the traffic impact resulting from proposed additional density at the Lexington Technology Park in Lexington, Massachusetts. The owner of the Lexington Technology Park, Patriot Partners Lexington, LLC, is seeking to amend the Preliminary Site Development Use Plan (PSDUP) originally approved by the May 2004 Town Meeting to increase the gross building floor area at the park from approximately 696,000 gross square feet (gsf)¹ by 380,000 gsf to 1,076,600 gsf. The space would house a mix of office and research and development uses.

Study Area

The traffic study area includes 11 intersections in the site environs. These are located principally along Spring Street, Hayden Avenue, Marrett Road and Concord Avenue and include the Route 2 interchanges with Concord Avenue and Hayden Avenue. These intersections were selected based on consultation with Town planning staff and include all intersections of Town roads expected to carry at least ten percent of the site traffic. All but two of the intersections studied are currently unsignalized.

Existing Conditions

During weekday commuter peak traffic hours, some delays are experienced on the roadway system. Following analysis procedures defined in the *Highway Capacity Manual*, at least one turning movement at six of the nine unsignalized intersections operates with long delays during one or both peak hours. (Long delays refer to Level of Service E or F operations as defined in the *Highway Capacity Manual*.) The signalized intersection of Waltham Street at Marrett Road operates with long delays during one or more peak hours. About 90,000 square feet of space at the Park was occupied under the traffic conditions analyzed.

Future Conditions

Peak hour traffic volumes were projected to a future year (2014) condition. For this analysis it was assumed that existing volumes on the roadway system grow at a rate of one percent per year. Additionally, it was assumed that the Ledgemont Corporate Center, located directly across Spring Street from the Lexington Technology Park, is fully built and occupied in accordance with the December 2008 traffic study prepared for this development. Also, it was assumed that the permitted but not yet built and occupied space at the Lexington Technology Park, approximately 473,459 square feet of gross floor area is constructed and generating traffic. The combination of existing traffic volumes grown as noted above plus site specific traffic from approved but not yet constructed and occupied development projects yields the 2014 “No Build” traffic conditions. Under the No Build conditions calculated peak hour travel delays on the roadway system increase. However, similar to existing conditions, six of the nine unsignalized intersections will have at least one turning movement operating at Level of Service E or F.

¹ The Zoning Board of Appeals on January 24, 2008 by Special Permit increased the original 631,600 gross floor area by 65,000 s.f. while maintaining the net square footage at 505,800 s.f.

With the requested PSDUP amendment new traffic could be generated to/from the subject site. Anticipated traffic volumes associated with an assumed 380,000 square feet of new office space at the site were assigned to the roadway system to determine 2014 “Build” traffic conditions. This amounts to 395 new trips during AM and PM peak hours and 2485 new daily vehicle trips. This added traffic will result in long delays during peak hours at seven of the nine signalized intersections (one more location than anticipated under No Build conditions). Delays at the two signalized intersections will marginally increase (increase by 16 seconds or less) relative to No Build conditions.

Potential Roadway Improvements

In consideration of existing and expected future traffic delays in the traffic study area, certain roadway improvements are identified as strategies to increase roadway capacity and reduce delays. These potential actions by location include:

- Concord Avenue/ Route 2 Eastbound Ramp – Install STOP sign on Concord Avenue with possible realignment of westbound Concord Avenue approach to make it intersect the Route 2 off Ramp at right-angle.
- Concord Avenue/Spring Street – Signalization with channelization for the westbound right-turn movement.
- Spring Street/Hayden Avenue/Patriot Way – Signalize with new exclusive southbound right-turn lane. Consider providing double left-turn lanes on the northbound Spring Street approach.
- Marrett Road/Spring Street/Bridge Street – Reconstruct intersection to provide eastbound right-turn lane and add a traffic signal. (This work is already in process and was supported in part with funding from Lexington Technology Park.).
- Hayden Avenue/Route 2 Westbound Off-Ramp – Consider signalization
- Hayden Avenue/Waltham Street – Signalization and consider minor widening to accommodate two through lanes and a right-turn lane on the southbound approach and two through lanes and a left-turn lane on the northbound approach.
- Middle Street/Marrett Avenue – As a temporary measure remove vegetation from island. Convert Middle Street east of Carry Road as a one-way eastbound street. Add signage highlighting roadway curvature, add grooved median delineator on Marrett Road. Consider realigning Carry Road approach such that it intersects Marrett Road at right-angle.

Not all of the above improvements are warranted at the present time and future traffic conditions should be monitored before making improvements.

Mitigation

In consideration of the traffic impacts on the roadway system associated with new traffic resulting from the Lexington Technology Park zoning proposal, Lexington Technology Park has entered into a Memorandum of Understanding (MOU) with the Town. The MOU obligates the Park to mitigate impacts using three related strategies. These include:

- Traffic Calming-Study and implement, if warranted, traffic calming measures in the Shade Street neighborhood.
- Travel Demand Management-Continue to provide dedicated shuttle bus services for site employees and continue to provide operating subsidies for the Town's Lexpress bus service.
- Infrastructure Improvements-Provided funding to the Town, in combination with funding from other development projects, to implement one or more of the roadway improvement projects cited above.

The full MOU is included in Appendix F of this report.

1.0 Introduction

Tetra Tech Rizzo has evaluated the potential traffic impacts associated with the additional laboratory and office space that is proposed at Lexington Technology Park in Lexington, Massachusetts and subject to Town Meeting approval of an amendment to the site's Preliminary Site Development Use Plan (PSDUP). The study evaluates traffic operating conditions in the project site vicinity under existing and future conditions with and without the additional development. Potential roadway improvements that would address existing and future traffic operations issues are also evaluated in the study.

1.1 Project Description

The proposed "project" considered in this study is the expansion of the Lexington Technology Park located in the northeast quadrant of the Route 2/Interstate 95 (Route 128) interchange in Lexington, Massachusetts. In 2004 Town Meeting approved a PSDUP for the site which was amended in 2007 allowing for the development and occupancy of up to 696,600 gross square feet (gsf) of office and laboratory space. Although only a portion of this approved space is presently built and occupied, a further amendment to the PSDUP is sought that would permit another 380,000 gsf of office and laboratory space at the site for a total of 1,076,600 gsf. The added space would address the long-term needs of existing and prospective tenants. The space would be provided in new buildings proposed along Patriot Way, the private way which functions as the main site access drive and which meets Spring Street directly opposite Hayden Avenue. No new site access points are proposed. The existing building at 125 Spring Street, which is part of the Lexington Technology Park, has separate and direct access to Spring Street, and will not be affected by this proposal.

1.2 Traffic Study Area

The traffic study area includes Spring Street, Hayden Avenue, Concord Avenue, Waltham Street, Marrett Road and the Route 2 interchanges at Hayden Avenue (Exits 53 and 54 A) and Concord Avenue (Exit 53). Eleven intersections are considered in the study. These are depicted in Figure 1 and are as follows:

- Concord Avenue and Route 2 eastbound on-off ramps (Exit 53)
- Spring Street and Concord Avenue
- Spring Street, Hayden Avenue and Patriot Way (site driveway)
- Spring Street and Shade Street
- Marrett Road (Route 2A), Spring Street and Bridge Street
- Middle Street/Marrett Road
- Hayden Avenue and Route 2 westbound on-ramp (Exit 53)
- Hayden Avenue and Route 2 westbound off-ramp (Exit 54 A)
- Waltham Street and Hayden Avenue
- Waltham Street/Marrett Road (signalized)
- Worthen Road/Waltham Street (signalized)

These intersections were selected based on consultation with Town planning staff as each is expected to carry at least ten percent of the new site traffic. All except the last two intersections on the list are currently unsignalized.

2.0 Existing Conditions

The following sections define existing roadway and traffic conditions in the site vicinity.

2.1 Roadway Segments

As noted above, the Lexington Technology Park is located proximate to Route 2 and Route 128 (Interstate 95), highways of regional significance, however there is no direct access to the site from either highway. The nearest access to the regional highway system is at Route 2 Exit 53 which includes ramps to/from Hayden Avenue and Concord Avenue. Local roadways providing site access are described below.

Spring Street

Spring Street passes through the town of Lexington in an approximate north-south direction. Spring Street south of Route 2 is designated as Old Spring Street. Spring Street provides one travel lane in each direction with additional turn lanes at intersections. Street lights are provided on the west side of the road. The posted speed limit is 30 miles per hour (mph). Office and residential land uses are located along the roadway. The roadway has a slight upgrade proceeding northbound north of Patriot Way. Pavement markings on Spring Street at Hayden Avenue and Concord Avenue consist of double yellow centerline and solid white edge lines. There are no pavement markings on Spring Street at Marrett Road or at the site driveway at 125 Spring Street. The pavement surface is in good condition. A sidewalk is presently under construction on Spring Street north of the site.

Hayden Avenue

Hayden Avenue runs between Spring and Waltham Streets in an east-west direction for approximately one mile. It provides one travel lane in each direction. There are no sidewalks. Pavement markings in this section of roadway consist of solid white edge lines and a double yellow centerline. Street lighting is provided on the north side of the road. The pavement is in good condition. Land uses along this roadway are mostly commercial. Ramps to Route 2 westbound are provided off of this roadway approximately 1,200 feet east of Spring Street.

Concord Avenue

Concord Avenue runs in an east-west direction parallel and south of Route 2. Between Spring Street and the Route 2 eastbound on-off ramps Concord Avenue has one travel lane in each direction. The posted speed limit is 35 mph. Land uses along this section of the roadway are mostly residential. The pavement surface is in good condition and pavement marking in this section of roadway consists of double yellow centerline. The Route 2 eastbound on-off ramps are located off of this roadway approximately 650 feet east of Spring Street.

Marrett Road (Route 2A)

Marrett Road passes east-west through the town of Lexington with one travel lane in each direction. Pavement markings in this section of roadway consist of solid white edge lines and double yellow centerline. The pavement is in good condition. Street lights and sidewalks are provided on the north side of the road. The posted speed limit is 30 mph. Land uses located along the roadway are mostly residential.

Waltham Street

In the Study area Waltham Street is a north-south roadway that provides that intersects with Hayden Avenue, Marrett Road and Worthen Road. In the vicinity of Hayden Avenue, Waltham Street is wide enough to provide two travel lanes in each direction. A raised concrete median at the center of the roadway separates the northbound and southbound traffic at this location. Generally curbing is provided on both sides of the roadway and street lighting is provided on the east side of the road. The speed limit on this street varies between 35 and 40 mph. Land uses along this roadway are commercial and residential.

Shade Street

Shade Street meets Spring Street just north of the project site and extends westward from Spring Street. It primarily provides local access to a residential neighborhood and does not function as a significant access route to the project site. In the vicinity of the project site, the roadway has no pavement markings, is approximately 20 feet wide and functions with one lane in each direction.

2.2 Intersections

Geometric and traffic control conditions at the eleven study area intersections are provided below.

Concord Avenue at Route 2 eastbound on-off ramps (Exit 53)

The Route 2 eastbound on and off ramps intersects Concord Avenue approximately 650 feet east of Spring Street to form an unsignalized three-way intersection. The Route 2 eastbound off-ramp provides access to Concord Avenue westbound only; no left turn is allowed. The approach has no STOP or YIELD control and drivers must merge with westbound traffic on Concord Avenue which also has no STOP or YIELD control. The Concord Avenue eastbound approach at this intersection is wide enough to function as a left turn lane and a through lane. Similarly, the westbound approach functions as a through lane and a right turn lane.

Spring Street and Concord Avenue

Spring Street at Concord Avenue is an unsignalized three-way intersection. The Concord Avenue approach is STOP controlled. The Spring Street southbound approach and Concord Avenue approach each have exclusive left turn lanes. The northbound Spring Street approach has one shared through/right lane. No crosswalks are provided at this intersection. Residential driveways just north of this intersection on the west side of Spring Street are close enough to affect operations at the intersection when turning movements are made.

Spring Street, Hayden Avenue and Patriot Way (site driveway)

Spring Street, Hayden Avenue and Patriot Way meet at a four-way unsignalized intersection. The Hayden Avenue and the Patriot Way approaches are STOP controlled while traffic on Spring Street is free. All approaches to this intersection provide exclusive left turn lanes and a through/right turn lane with the exception of the Hayden Avenue approach, which has a channelized right turn lane under YIELD-sign control, an exclusive left turn lane and a through lane. No crosswalks are provided at this intersection. There is curbing on both sides of all approaches. There is a guardrail on Spring Street for both the southbound and northbound approaches.

Spring Street and Shade Street

Spring Street at Shade Street is an unsignalized three-way intersection. Shade Street is under STOP-control. All approaches to the intersection have one shared lane.

Marrett Road (Route 2A), Spring Street and Bridge Street

Marrett Road at Spring Street and Bridge Street is an unsignalized four-way intersection. Spring Street and Bridge Street meet Marrett Road from the south and southeast, respectively. Spring Street is under STOP control while Bridge Street is one-way arriving at the intersection. The Marrett Road and Spring Street approaches to this intersection all provide one travel lane in each direction

Middle Street and Marrett Road

Middle Street intersects Marrett Road at an acute angle to form a three way unsignalized intersection. Carry Road intersects Marrett Avenue at about feet west of Middle Street. While majority of the left-turns from Marrett Road on to the neighborhood is made at Middle Street approach, majority of the right-turns from Marrett Road are made at Carry Avenue approach. Similarly the left-turns out of the neighborhood use Carry avenue approach and the right-turns use the Middle Street approach. At this location there is a sharp horizontal curve along Marrett Road as it changes orientation from southeast/northwest to east/west direction. Middle Street is a minor roadway that provides access to residential uses in the area. Marrett Road is the major roadway and has the free right-of-way while Middle Street operates under STOP control. Crosswalks are provided across both Middle Street approach and across the southeast bound Marrett Road approach.

Hayden Avenue at Route 2 westbound on-ramp (Exit 53)

The Route 2 westbound on-ramp is accessed from Hayden Avenue approximately 1,200 feet east of Spring Street at an unsignalized three-way intersection. Guardrails are provided on both sides on Hayden Avenue at this intersection. The eastbound and westbound approaches on Hayden Avenue are wide enough to accommodate turning and through traffic in separate lanes.

Hayden Avenue at Route 2 westbound off-ramp (Exit 54)

The Route 2 westbound off-ramp intersects Hayden Avenue approximately 500 feet west of Waltham Street to form an unsignalized three-way intersection. The left turn from the off-ramp to Hayden Avenue is under STOP control and the right turn from the ramp is channelized and is under YIELD control. Hayden Avenue eastbound and westbound approaches this intersection with one travel lane in each direction.

Waltham Street and Hayden Avenue

Hayden Avenue intersects Waltham Street to form an unsignalized T-intersection. The Hayden Avenue approach consists of a left turn lane under STOP control and an exclusive channelized right turn lane under YIELD control. The Waltham Street northbound approach consists of an exclusive left turn lane and a through lane. The Waltham Street southbound approach operates with one through lane and a shared through/right turn lane. The intersection includes a raised island which separates the northbound and southbound traffic.

Waltham Street and Marrett Road

This is a four-way signalized intersection abutted by gas-stations and other retail uses. The eastbound and westbound Marrett Road approaches consist of one lane in each direction of travel. The northbound and southbound approaches of Waltham Street each provide a through lane and a left-turn lane. Crosswalks are provided across all approaches at the intersection.

Waltham Street and Worthen Road

Worthen Road at Waltham Street is a signalized four-way intersection. Worthen Road serves residential uses, parks and other recreational uses. The eastbound and westbound Worthen Road approaches consist of one lane in each direction of travel. The Waltham Street northbound and southbound approaches each provide a through lane and a left-turn lane. Crosswalks and pedestrian signals are provided across the southbound Waltham Street and eastbound Worthen Road approaches.

2.3 Traffic Volumes

A comprehensive traffic count program was conducted for much of the study area in February 2009. The locations counted in February 2009 were also counted for the December 2008 traffic impact study for the Ledgemont Corporate Center. (The Ledgemont counts were done in June 2008.) A comparison of the two sets of traffic data showed no significant differences and consequently data from the Ledgemont study was used for the Lexington Technology Park study. This allowed for the presentation of consistent existing conditions baseline in the two studies thereby simplifying the public review process for the two projects. Four of the intersections included in the current study are not part of the Ledgemont study. These include the following intersections:

- Middle Street/Marrett Road
- Waltham Street/Marrett Road
- Worthen Road/Waltham Street
- Concord Avenue at Route 2 Eastbound On-Off Ramps (Exit 53)

The first three were counted in June 2009 and the last location was counted in February 2009. See Appendix A for count data sheets. Automatic Traffic Recorder (ATR) and Turning Movement Count (TMC) data used in this study are described below.

2.3.1 Daily Traffic Volumes

Daily traffic on Spring Street just north of Patriot Way is 8,200 vehicles per day with 12 percent of that traffic occurring during the morning peak hour and another 12 percent occurring during the afternoon peak hour. The hours of heaviest traffic on Spring Street are from 7:45 to 8:45 in the morning and at from 5:00 to 6:00 in the afternoon. Traffic is heavily directional with 82 percent of the volume southbound in the morning and 67 percent northbound in the afternoon. Hayden Avenue volumes are slightly lower, only 6,000 vehicles per day east of the Ledgesmont Driveway. This information is summarized in Table 1.

Table 1 Existing Traffic Volume Summary

Location	Spring St., north of Hayden Ave.	Hayden Ave., east of Ledgesmont
Average Weekday Volume	8,200 vpd	6,000 vpd
AM Peak		
Volume	1,020 vph	720 vph
Peak Direction and %	82% Southbound	50% Westbound
K factor	0.12	0.12
PM Peak		
Volume	1,020	590
Peak Direction and %	67% Northbound	65% Eastbound
K factor	0.12	0.10

Source: Traffic Impact Study, Three Ledgesmont Office Building. BSC Group, December, 2008.

Notes: Vpd – Vehicles Per Day, Vph – Vehicles Per Hour, K factor: proportion of daily traffic

2.3.2 Peak Hour Traffic Volumes

The peak hour traffic flow networks are shown in Figures 2 and 3 for the AM and PM peak hours, respectively. As shown, consistent with the above ATR data, the primary flows along Spring Street at the project site are southbound (toward Route 2) during the morning peak hour and northbound (toward Marrett Road) during the afternoon peak hour.

Observed peak hour traffic volumes using Patriot Way are summarized in Table 2. The 2008 data from the Ledgesmont study reflect trip generation associated with approximately 90,000 square feet of building space occupied at the time of the counts plus construction traffic. The 2009 data excludes construction traffic and reflects 222,541 square feet of space occupied along Patriot Way.

Table 2 Existing Site Traffic Summary

Location	2008 Counts		2009 Counts	
	Morning Peak Hour	Afternoon Peak Hour	Morning Peak Hour	Afternoon Peak Hour
Entering Site				
Trips	72	12	139	12
Percent	75%	18%	79%	9%
Exiting Site				
Trips	24	55	38	121
Percent	25%	82%	21%	91%
Total	96	67	177	133

Note: 2008 data collected for the Ledgemont study when 90,000 sf of space was occupied on Patriot Way. 2009 data collected by Tetra Tech Rizzo for the Lexington Technology Park project when 222,541 sf of space was occupied on Patriot Way.

2.4 Traffic Safety

Crash data for the study area is presented here. The study examines the most recent available traffic crash data from MassHighway for the latest available three-year period, 2005 through 2008. A summary of the crash information is presented below and the analysis worksheets are provided in Appendix B.

The accident rates at study area intersections were calculated in terms of accidents per million entering vehicles (MEV) at each intersection. The calculated rate was compared to the most recent average accident rates for unsignalized intersections statewide and for the MassHighway District Four. The site is located in MassHighway District Four. As shown in Table 3, the calculated crash rate at the signalized intersection of Marrett Road and Waltham Street exceeds both the statewide average rate and the District Four average rates. Average crash rates at three of the nine unsignalized intersections exceed the average statewide and district rates. These intersections are Hayden Avenue at Waltham Street, Concord Avenue at Spring Street, and Marrett Road at Middle Street. The calculated crash rate at the intersection of Spring Street and Patriot Way/Hayden Avenue is higher than the District Four average rate and is less than the statewide average rate.

The crash data were also reviewed to determine if any particular pattern of crashes was noticed at the high crash rate locations. At the intersection of Middle Street and Marrett Road considerable number for crashes were head-on type crashes that occurred between vehicles travelling in the eastbound and westbound directions. Field observations indicate presence of vegetation on a traffic island west of Middle Street that compromises visibility from Middle Street. Marrett Road at this location has a horizontal curve that could contribute to the high crash rate. At the Hayden Avenue/Waltham Street intersection, seven of the ten rear-end type crashes were reported on the eastbound direction of travel. At all other locations, a distinct crash pattern could not be identified.

The crash analysis completed by the Ledgemont study was based on data from years 2004 to 2006 and does not use updated statewide and district average crash rates. The current study uses more recent data and the results are generally comparable to those from the Ledgemont study.

Table 3 Crash Data Summary (2005 to 2007)

	Concord Avenue at Route 2 eastbound On/Off Ramp	Concord Avenue at Spring Street	Patriot Way/Hayden Avenue at Spring Street	Shade Street at Spring Street	Marrett Road At Spring Street/Bridge Street	Middle Street at Marrett Road	Hayden Avenue at Route 2 westbound On Ramp	Hayden Avenue at Route 2 westbound Off Ramp	Hayden Avenue at Waltham Street	Marrett Road at Waltham Street	Worthen Road at Waltham Street
Year											
2007	0	5	4	0	3	5	1	3	5	10	7
2006	1	4	2	0	2	2	0	4	8	16	5
2005	<u>0</u>	<u>3</u>	<u>5</u>	<u>1</u>	<u>3</u>	<u>4</u>	<u>2</u>	<u>2</u>	<u>6</u>	<u>7</u>	<u>5</u>
Total	1	12	11	1	8	11	3	9	19	33	17
Type											
Angle	0	7	7	0	3	1	2	0	6	13	3
Rear-end	0	4	0	0	3	1	0	6	10	13	11
Head-on	0	0	1	0	0	7	0	0	0	1	0
Unknown-Other	<u>1</u>	<u>1</u>	<u>3</u>	<u>1</u>	<u>2</u>	<u>2</u>	<u>1</u>	<u>3</u>	<u>3</u>	<u>6</u>	<u>3</u>
Total	1	12	11	1	8	11	3	9	19	33	17
Severity											
Property Damage	1	12	4	0	6	2	3	5	17	19	10
Personal Injury	0	0	7	1	1	8	0	3	2	10	6
Fatality	0	0	0	0	0	0	0	0	0	0	0
Other/Unknown	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>1</u>	<u>0</u>	<u>1</u>	<u>0</u>	<u>4</u>	<u>1</u>
Total	1	12	11	1	8	11	3	9	19	33	17
Weather											
Clear	1	4	6	1	3	9	3	6	13	24	13
Cloudy/Rain	0	7	5	0	4	2	0	2	6	7	4
Snow/Ice	0	1	0	0	1	0	0	1	0	2	0
Other/Unknown	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total	1	12	11	1	8	11	3	9	19	33	17
Time											
7:00 AM to 9:00 AM	0	3	3	0	2	3	1	1	6	7	3
9:00 AM to 4::00 PM	0	4	4	1	2	4	1	3	7	14	8
4:00 PM to 6:00 PM	1	4	2	0	2	1	1	1	2	6	3
6:00 PM to 7:00 AM	<u>0</u>	<u>1</u>	<u>2</u>	<u>0</u>	<u>2</u>	<u>3</u>	<u>0</u>	<u>4</u>	<u>4</u>	<u>6</u>	<u>3</u>
Total	1	12	11	1	8	11	3	9	19	33	17
Statewide Average	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.80	0.80
District 4 Average	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.78	0.78
Accident Rate ¹	0.10	0.61	0.59	0.08	0.37	0.74	0.32	0.54	0.64	1.02	0.71

Source: MassHighway Accident Records (2003-2005)
1 Accident rates per million entering vehicles (MEV) calculated using MassHighway worksheet

3.0 Future Conditions

Traffic volumes and roadway conditions in the study area were reviewed for the year 2014 which represents a five-year planning horizon consistent with state requirements for traffic impact studies. Independent of the proposed development, traffic volumes on the roadway network in 2014 will include existing traffic, new traffic resulting from general growth and traffic growth related to other known development projects in the area, including space on the project site which is permitted but is not yet built and occupied. This represents “No-Build” traffic conditions. “Build” traffic conditions include No-Build conditions plus traffic associated with new development which could occur with approval of the requested PSDUP amendment. The 2014 roadway system is assumed to include currently planned roadway improvement projects.

3.1 2014 No-Build Traffic Volumes

The 2014 Build condition traffic flow networks from the Ledgemont traffic study generally incorporates all of the above elements and represent the 2014 No-Build condition for this (Lexington Technology Park) study. Specifically, the Ledgemont Future Build condition networks considered an overall traffic growth rate of one percent per year applied to the existing traffic volumes. (This is a conservative figure given that there has been little or no growth since 2003 in study area volumes.) Additionally, it includes background development traffic. Background traffic includes traffic anticipated from the Lexington Technology Park project under “by-right” conditions, that is, associated with 631,000 square feet of building floor area as described in the 2003 traffic study for the Lexington Technology Park, and traffic from full build out of the proposed AvalonBay residential development at the former Metropolitan State Hospital site on Concord Avenue. Finally, it includes all traffic from the currently proposed expansion of Ledgemont by 162,000 square feet. However, due to an omission in the reporting of the full build out traffic volumes in the 2003 Lexington Technology Park study, the 2014 Build volumes from the Ledgemont study were adjusted upward to become the 2014 No-Build traffic volumes for the current study. The AM and PM commuter peak hour volumes are shown in Figures 4 and 5, respectively.

3.2 Future Roadway Improvements

In addition to traffic volume changes, roadway improvements planned in the study area are considered in the 2014 No-Build and Build traffic analyses. Roadway improvements are proposed by the Town of Lexington along Spring Street, at the Marrett Road / Spring Street / Bridge Street intersection and at Marrett Road/Waltham Street intersection.

3.2.1 Spring Street Corridor Improvements

The Town of Lexington is in the process of adding sidewalks and crosswalks along Spring Street. The project extends from the bridge carrying Spring Street over Route 2 northward to the intersection of Spring St, Marrett Road (Route 2A), and Bridge Street. Beginning at the south (Route 2) end, the sidewalk will be on the western side of Spring Street and extend past Patriot

Way and 125 Spring Street to approximately Hudson Road. North of Hudson Road, the sidewalks will continue on both sides of Spring Street northward up to Marrett Road.

3.2.2 Marrett Road/Spring Street/Bridge Street Improvements

The Town of Lexington is in the final stages of planning for improvements to the intersection of Marrett Road (Route 2A), Spring Street, and Bridge Street. As of early February 2009 there were three alternative designs under consideration for this location. Under all alternatives, Bridge Street would be closed at this intersection (the northwest end of Bridge St.) and become a cul-de-sac with access and egress only via the southeast. Additionally, a westbound left-turn lane would be added to Marrett Road. All alternatives also anticipate the future full signalization of the Marrett Road/Spring Street intersection. A signal operating in flash mode only and/or with a button-actuated pedestrian phase may be used on an interim basis.

3.2.3 Marrett Road/Waltham Street Improvements

The Town of Lexington will be upgrading the intersection at Marrett Road (Rte. 2A) and Waltham Street during the summer of 2011. This project will be funded with a Massachusetts Opportunity Relocation and Expansion (MORE) jobs capital grant. The intersection work will improve pedestrian and vehicular safety and increase traffic volume capacity. The preliminary design indicates traffic signal reconstruction, minor pavement widening and sidewalk reconstruction. The design includes additional left-turn lanes on Eastbound and westbound Marrett Road approaches to the intersection. The existing southbound channelized right-turn lane on Waltham Street will be removed and a shared left/through and a through/right turn lane with provided on the approach. The new signal timing plan shows that the northbound and westbound left-turn movements will operate under protected-permissive phasing, while the southbound and eastbound left-turns will operate under permissive phases.

3.3 2014 Build Condition

Future Build traffic conditions represent the No-Build traffic volumes plus traffic associated with the potential new development allowed by the requested PSDUP amendment.

3.3.1 Project Trip Generation

The expected volume on new traffic associated with the requested PSDUP amendment is dependent upon the expected future land use conditions. For the purpose of estimating expected new site traffic, trip generation for the potential development conditions was compared to the trip generation for the previously approved 2003/2004 program (631,000 square feet of development) included in the No-Build traffic network. The applicable trip rates were selected from the publication *Trip Generation* (Institute of Transportation Engineers, Eighth Edition, 2008). The appropriate categories for the potential development are Research and Development Center (ITE Land Use Code 760) for the proposed biotech laboratory space; General Office Building (ITE Land Use Code 710) for the potential office space; and, Light Manufacturing (ITE Land Use Code 140) for the potential manufacturing space.

The potential development program includes approximately 1,076,600 square feet of building area. Based on current commitments for the use of space and the assumption that all new space at 100 and 600 Patriot Way will be used as office space (as a worst case scenario), future land use conditions are defined in Table 4.

Table 4 Lexington Technology Park Proposed Land Use Program

Building	Status	Floor Area (Gsf)			
		Office	Lab	Manufacturing	Total
125 Spring Street	Existing	25,517	25,517		51,034
300 Patriot Way	Existing	71,900	71,899		143,799
500 Patriot Way	Existing	69,615	29,835		99,450
Subtotal Existing		166,032	127,251		294,283
200 Patriot Way	Under Construction	94,669	94,668		189,337
400 Patriot Way	Under Construction			212,980	212,980
Subtotal Under Construction		94,669	94,668	212,980	402,317
100 & 600 Patriot Way	Proposed	380,000			380,000
Subtotal Proposed		380,000			380,000
TOTAL		641,701	221,919	212,980	1,076,600

¹ Office use assumed for worst-case trip generation. Building may include laboratory space when constructed.

Anticipated trip generation from this land use program based on ITE rates is shown in Table 5 (See Appendix C). As noted, the program will generate approximately 8300 daily vehicle trips with 1245 and 1200 trips occurring during the AM and PM peak hours, respectively.

Table 5 Trip Generation Estimates at Full Build Out

Land Use	Area (Gsf)	AM Peak Hour		PM Peak Hour		Weekday	
		Avg Trip Rate ^{1,2}	Trips	Avg Trip Rate ^{1,2}	Trips	Avg Trip Rate ^{1,2}	Trips
Office	641,700	1.29	830	1.24	800	8.70	5,580
Laboratory	221,920	1.19	265	1.12	250	8.74	1,940
Manufacturing	213,000	0.69	150	0.72	150	3.78	805
TOTAL	1,076,600	1.16	1,245	1.11	1,200	7.73	8,325

Based on *Trip Generation* (Institute of Transportation Engineers, Eighth Edition, 2008) for Land Use Code 710 (General Office), Land Use Code 760 (Research and Development) and Land Use Code 140 (Manufacturing)

¹ Vehicle trips per thousand square feet of gross floor area

² Most calculations based on non-linear functional estimates. Values shown are trips per total gsf.

The PSDUP reviewed and approved in 2003 and 2004 permitted a range of land use programs at the site. The “worst case scenario” considered at the time would generate up to 850 trips in the morning peak hour and 805 trips in the afternoon peak hour. In Table 6, the trips previously permitted by the town are compared to the ITE trip estimates from Table 5 for the current proposed land use program. The trips permitted by the town in 2003/2004 are included in the No-Build analysis; hence the difference between the permitted trips and the proposed trips represent net new trips generated by the current program. As shown, the net new peak hour traffic increases associated with the proposed amendment to the PSDUP are 395 trips during both the AM and PM peak hours.

Table 6 Net New Project Traffic

Time Period/Direction	Vehicle Trips		
	Permitted	Proposed Full Build Out	Net New
AM Peak Trips	850	1,245	395
Entering	745	1,065	320
Exiting	105	180	75
PM Peak Trips	805	1,200	395
Entering	135	230	95
Exiting	670	970	300
Weekday Daily Trips	5,840	8,325	2,485

Note: Permitted trips based on the land use program in the June 3, 2003 Traffic Impact Study prepared by Tetra Tech Rizzo. The program includes 528,000 gsf of office space (ITE LUC 710) and 103,000 gsf of research and development space (ITE LUC 760). The total floor area includes 631,000 gsf.

The above analysis is based strictly on ITE rates. An alternative trip generation analysis was also developed based on existing conditions observed at the site. As noted, traffic counts have been conducted on the site driveways. The most recent counts were conducted on February 4, 2009 when approximately 222,541 gross square feet of space in the park was fully leased and occupied. Table 7 presents the observed site traffic volumes and trip generation rates. Applying these rates to the total potential floor under full build out area yields estimates of 860 AM peak hour and 645 PM peak hour vehicle trips. The more conservative ITE based traffic forecasts were used in the analyses that follow.

Table 7 Alternative Traffic Forecast

Time Period/Direction	Existing Site Trips	Existing Trip Rate (Trips/1000 gsf)	Future Trips at Full Build Out
AM Peak Trips	177	0.80	861
Entering	139	0.62	668
Exiting	38	0.17	183
PM Peak Trips	133	0.60	646
Entering	12	0.05	54
Exiting	121	0.54	581

Note: Existing trips based on counts done on February 4, 2009 with 222,541 gsf of occupied space at the Lexington Technology Park. Full Build Out assumes 1,076,600 gsf of occupied space.

3.3.2 Project Trip Distribution

The net new project generated vehicle trips were assigned to the roadway network consistent with the trip distribution assumptions used in the Ledgesmont Corporate Center report. The Ledgesmont study travel patterns are based on existing traffic volume patterns as well as data regarding the geographical distribution of employee residences at the Ledgesmont Corporate Center. The proposed development at the Lexington Technology Park is expected to draw employees from a similar geographic distribution. The project trip distribution is depicted in

Figure 6. Based on the trip distribution percentages, new project traffic (from Table 6) was assigned to the study area roadway network. The resulting peak hour traffic assignments are shown in Figure 7 (AM) and Figure 8 (PM).

3.3.3 2014 Build Condition Traffic Volumes

The combined new site traffic and No-Build traffic volumes represent the 2014 Build Condition traffic flow networks. These networks are shown in Figures 9 and 10 for the AM and PM peak hours, respectively.

3.4 Traffic Operations Analysis

Intersection operating levels of service were determined for Existing, 2014 No-Build and 2014 Build conditions in order to define the impacts of the requested PSDUP amendment on roadway operations. The level of service evaluation criteria and analysis results are presented below.

3.4.1 Level of Service Criteria

Level of service (LOS) is a term used to describe the quality of the traffic flow on a roadway facility at a particular point in time. It is an aggregate measure of travel delay, travel speed, congestion, driver discomfort, convenience, and safety based on a comparison of roadway system capacity to roadway system travel demand. Operating levels of service are reported on a scale of A to F, with A representing the best operating conditions and F representing the worst. Depending upon the type of facility being analyzed, level of service A represents free-flow or uncongested conditions with little or no delay to motorists, while level of service F represents long delays with traffic demands sometimes exceeding roadway capacity.

Roadway operating levels of service are calculated following procedures defined in the *2000 Highway Capacity Manual*, published by the Transportation Research Board. For unsignalized and signalized intersections, the operating level of service is based on travel delays. Delays are generally calculated as a function of traffic volume, peaking characteristics of traffic flow, percentage of heavy vehicles in the traffic stream, type of traffic control, number of travel lanes and lane use, intersection approach grades, pedestrian activity, and signal timing, phasing, and progression where applicable.

The calculated average delay per vehicle for signalized intersections applies to all vehicles entering the intersection and under control of the traffic signal. For unsignalized intersections, it is assumed that through movements on the main street have the right of way and are not delayed by side street traffic. Consequently, for unsignalized intersections, average delay values apply only to the minor street intersection approaches or to left turns from the major street into the minor street, which must yield to oncoming traffic. The level of service and delay threshold criteria for signalized and unsignalized intersections are given in Table 8.

Table 8 Level of Service Criteria

Level of Service	Average Delay per Vehicle (Seconds)	
	Signalized Intersections	Unsignalized Intersections
A	≤10.0	≤10.0
B	10.1 to 20.0	10.1 to 15.0
C	20.1 to 35.0	15.1 to 25.0
D	35.1 to 55.0	25.1 to 35.0
E	55.1 to 80.0	35.1 to 50.0
F	>80.0	>50.0

Source: *Highway Capacity Manual*, Transportation Research Board, National Research Council, 2000

3.4.2 Capacity Analysis

The procedures described above were used to determine existing and future peak hour levels of service at the study area intersections using the Synchro Version 6.0 software package. The Synchro model applies the procedures of the Highway Capacity Manual. The capacity analysis worksheets are provided in Appendix D and the results are summarized in Table 9.

As shown, under existing conditions, six of the nine unsignalized intersections operate with LOS E or F during one or both the morning and afternoon peak hours. The intersections of Spring Street/Concord Avenue and Marrett Road/Spring Street/Bridge Street operate over capacity, with delays in excess of 120 seconds during both the morning and afternoon peak hours. Under existing conditions, the signalized intersection of Waltham Street/Marrett Road operates over capacity with LOS F and delays greater than 120 seconds per vehicle during both analysis peak hours. The signalized intersection at Waltham Street/Worthen Road operates under capacity, at LOS C or better during both peak hours.

The six unsignalized intersections that operate with long delays under existing conditions continue to experience long delays under 2014 No-Build conditions. In addition the Shade Street/Spring Street intersection operates at LOS E and at 45 percent capacity during morning peak hour. Other two unsignalized intersections operate with level of service better than E during both peak periods under No-Build conditions. However, the delays and volume to capacity ratios at all unsignalized intersections increase in the No-Build scenario relative to existing conditions during both morning and afternoon peak hours.

The analysis assumes that the roadway improvements planned by the town at the intersections of Marrett Road/Spring Street/Bridge Street and Marrett Road/Waltham Street will be implemented under 2014 No-Build conditions. At the time of this writing, the proposed signal timing plans were not available from the town. Hence signal timings optimized for No-Build volumes were assumed for analysis. The Marrett Road/Spring Street intersection will be signalized in 2014 No-Build year and will continue to operate with LOS F, although the delays and volume to capacity ratios are reduced moderately relative to existing conditions. The intersection of Waltham Street/Marrett Road operates with LOS E in the morning peak hour and LOS D in the afternoon peak hour. Reductions in delays and volume to capacity ratios were also seen at this location relative to existing conditions. The Worthen Road/Waltham Street intersection operates with LOS C during both peak hours under No-Build conditions.

Table 9 Capacity Analysis Results

		Existing (2009)			Future (2014)					
					No-Build			Build		
		Peak Hour	LOS ³	Delay ²	V/C ¹	LOS	Delay	V/C	LOS	Delay
<u>Unsignalized Intersections</u>										
Concord Ave/Rte 2 EB Ramp										
Route 2 EB Ramp SB R	AM	B	11.3	0.39	D	31.3	0.87	F	61.0	1.03
	PM	B	10.2	0.26	B	10.9	0.34	B	11.3	0.38
Concord Ave/Spring St.										
Concord Ave WB L	AM	F	*	1.41	F	*	>1.5	F	*	>1.5
	PM	F	*	1.01	F	*	>1.5	F	*	>1.5
Spring S.t/Hayden Ave/Patriot Way										
Patriot Way EB L	AM	E	36.8	0.13	F	*	>1.5	F	*	>1.5
	PM	E	47.3	0.20	F	*	>1.5	F	*	>1.5
Hayden Ave WB L	AM	F	*	>1.5	F	*	>1.5	F	*	>1.5
	PM	F	108.0	0.85	F	*	>1.5	F	*	>1.5
Marrett Rd./Spring St/Bridge St.										
Spring St NB	AM	F	*	>1.5	signalized			signalized		
	PM	F	*	>1.5						
Hayden Ave/Rte 2 WB On-Ramp										
Hayden Ave WB L	AM	A	3.9	0.15	A	3.9	0.17	A	4.1	0.18
	PM	A	5.7	0.21	A	10.0	0.39	B	12.9	0.47
Hayden Ave/Re 2 WB Off-Ramp										
Re 2 WB Off Ramp NB L	AM	F	65.8	0.94	F	*	>1.50	F	*	>1.5
	PM	C	15.1	0.23	C	21.0	0.39	D	27.3	0.51
Hayden Ave/Waltham St.										
Hayden Ave EB L	AM	F	*	1.39	F	*	>1.5	F	*	>1.5
	PM	F	115.7	0.87	F	*	>1.5	F	*	>1.5
Spring St/Shade St										
Shade St. EB	AM	C	23.3	0.26	E	36.9	0.45	E	43.0	0.49
	PM	B	12.1	0.07	B	14.5	0.12	C	15.3	0.13
Middle St./Marrett Rd.										
Middle St NB	AM	D	34.2	0.36	E	49.5	0.47	F	54.7	0.50
	PM	F	69.0	0.60	F	82.0	0.66	F	94.3	0.70
<u>Signalized Intersections</u>										
Waltham St/Marrett Rd.										
	AM	F	*	>1.5	E	60.4	1.00	E	67.8	1.03
	PM	F	*	1.44	D	53.0	0.96	E	59.8	1.00
Worthen Rd./Waltham St.										
	AM	B	19.1	0.74	C	27.1	0.81	C	28.8	0.80
	PM	C	20.9	0.83	C	20.3	0.68	C	24.2	0.75
Marrett Rd./Spring St/Bridge St.										
	AM	unsignalized			F	*	1.22	F	*	1.29
	PM				F	106.0	1.16	F	*	1.23

¹ LOS= Level of Service ² Delay = Average delay expressed in seconds per vehicle

³ V/C = Volume-to-Capacity ratio L = Left Turn, T = Through, R = Right Turn * Calculated delay exceeds 120 seconds

Under 2014 Build conditions, all six unsignalized intersections that operate with long delays under No-Build conditions continue to operate with LOS E or F. The signal timing used at signalized intersections under No Build conditions was used without any changes for Build conditions analysis to provide true comparison of operations. The signalized intersection of Worthen Road/Waltham Street operates with LOS C during both peak hours under Build conditions. The Waltham Street / Marrett Road intersection continues to operate with LOS E during morning peak hour as in the No-Build conditions. The intersection of Marrett Road/Spring Street continues to operate at LOS F in Build conditions, similar to No Build conditions.

3.5 Signal Warrants Analysis

In the past, police details have been used to manage evening peak hour traffic flows at the Spring Street/Hayden Avenue/Patriot Way intersection. Consequently, a traffic signal warrant analysis was conducted for this location to determine if traffic signal control is warranted now or will be warranted under future conditions. The analysis was conducted in accordance with the guidelines of the *Manual on Uniform Traffic Control Devices* (U.S. Department of Transportation, 2000). Multiple signal warrants were considered including: the peak hour warrant; the four-hour warrant; and, the eight-hour warrant. Of these three warrants, only the eight-hour warrant is routinely accepted by MassHighway. Intersections on state highways that only satisfy the peak hour or four-hour warrants generally come under greater scrutiny before a signal is installed. The peak hour and four-hour warrants can be used by municipalities to justify traffic signals at intersections of locally-owned roadways. Detailed warrant calculations are contained in Appendix E and the analysis results are summarized in Table 10.

Table 10 Signal Warrant Analysis Summary: Broadway and Computer Drive

Warrants	Warrant Criteria Satisfied		
	2009 Existing	2014 No-Build	2014 Build
Warrant 1 – Eight Hour Vehicular Volume			
Condition A	NO	NO	YES
Condition B	NO	NO	NO
Warrant 2 - Four Hour Vehicular Volume	NO	YES	YES
Warrant 3 - Peak Hour Vehicular Volume	YES	YES	YES
ALL THREE WARRANTS MET?	NO	NO	YES

As shown, under existing conditions at the Spring Street/Hayden Avenue/Patriot Way intersection only the peak-hour signal warrant is met. Minor street traffic volumes on Hayden Avenue trigger the warrant. Volumes on Patriot Way are not at a level to warrant a signal. Under existing conditions, the criteria for four-hour and eight-hour warrants are not met.

Warrant analysis results for 2014 No Build conditions indicated that the peak hour and four-hour warrants are met. The 2014 Build condition volumes meet the warrant criteria for all three volumes warrants namely; the peak-hour and four-hour and the eight-hour warrants.

4.0 Traffic Mitigation

A Traffic Mitigation Plan is proposed in consideration of the requested PSDUP amendment that is modeled after the mitigation agreement approved during the 2003/2004 PSDUP process for the subject site. At the time, a Traffic Mitigation Plan was agreed upon which included two components. First, the plan provided Transportation Demand Management measures (TDM) and funding aimed at reducing single occupant vehicle trips to/from the project site and on Lexington roadways in general. Second, the plan provided funds to be spent on physical improvements to area roadways at the discretion of the Town. The current mitigation commitment extends the TDM program to the potential additional building floor area at the project site and offers additional funding for Lexington's transit operations and/or physical roadway improvements. Components of the 2003/2004 traffic mitigation program is listed below.

2003/2004 Traffic Mitigation Program

- Patriot Partners shall appoint a staff person to act as ongoing site transportation coordinator.
- Patriot Partners shall participate in ride sharing, guaranteed ride home and other transportation demand management programs.
- Patriot Partners shall make an annual \$10,000 contribution to Lexington's transit provider, LEXPRESS, increasing to \$20,000 upon reaching occupancy of 180,000 square feet (50 percent of the existing floor area) at the Park.
- Patriot Partners shall make an additional \$10,000 contribution to LEXPRESS in any given year after reaching occupancy of 180,000 square feet that trip generation targets are not met.
- The above contributions shall be adjusted annually for inflation based upon a change in the Consumer Price Index for the Boston, Massachusetts, metropolitan area.
- Patriot Partners shall ensure that design of on-site traffic circulation can accommodate a LEXPRESS bus and will provide an on-site bus shelter.
- Patriot Partners shall ask that LEXPRESS modify its Route #2 to allow buses to enter the project site.
- Patriot Partners shall deposit in escrow with the Town a sum of \$100,000 to be discussed by the Planning Board after consultation with appropriate Town Boards and Departments to fund traffic mitigation improvements and/or services which benefit the Project such as, but not limited to:
 - Operating subsidy for LEXPRESS
 - Financial support in hiring a Transportation Coordinator by the Town.
 - Design and/or reconstruction of the Marrett Road/Spring St. intersection
 - Design and/or reconstruction of sidewalks along Spring St. and/or Shade St
 - Design and/or reconstruction of traffic calming devices along Shade St.
- Beginning in year one, Patriot Partners shall maintain commuter shuttle bus service between the project site and the Alewife MBTA station either through membership in the 128 Business Council or by operating a private shuttle with direct "door to door" service. The private shuttle would operate with a single vehicle on a continuous loop to/from the Alewife Station during commuter peak hours. The vehicle will be available for on-demand service and transportation to Lexington Center during other hours of the workday.
- Upon traffic volumes at the site driveway meeting peak hour traffic signal warrants as defined in the Federal Highway Administration's (FHWA) Manual of Uniform Traffic Control Devices (MUTCD), Patriot Partners shall provide peak period police officer control at the main site driveway/Spring Street intersection.

- Patriot Partners shall monitor site traffic generation on an annual basis to determine if trip generation goals are met and if a police detail is warranted at the site driveway. Patriot Partners shall also report results to the Planning Board, Town Planner and/or Town Transportation Coordinator.
- Should LEXPRESS cease operations, committed contributions will be deposited by Patriot Partners into a fund to be used by the Town to implement transportation system improvements in the project vicinity. Specific uses may include but not be limited to: design and construction of a traffic signal and related improvements for the Marrett Road/Spring Street intersection; design and construction of sidewalks along Spring Street; and, design and construction of traffic calming measures for Shade Street.
- Patriot Partners will join the South Lexington Transportation Organization and participate in its ongoing activities.

The 2003/2004 mitigation plan was agreed upon in support of up to 696,600 square feet of gross building floor area. Prior to the 2003/2004 PSDUP approval there was 361,000 square feet of building floor space on the site.

4.1 Traffic Mitigation in Place

As required by the 2003/2004 agreement, certain mitigation measures have been implemented by the applicant, Patriot Partners and/or the site's principal tenant, Shire. Specifically,

- Jim Palmer has been appointed as a site transportation coordinator.
- Patriot Partners and Shire have joined the 128 Business Council and now have access to the ride sharing, guaranteed ride home and other transportation demand management programs offered by the 128 Business Council.
- Patriot Partners made \$10,000 contributions to Lexington's transit provider, LEXPRESS, from 2004 through 2007 and \$20,000 contributions in 2008 after reaching occupancy of 180,000 square feet at the Park.
- Patriot Partners has developed internal site plans that can accommodate the turning movements of a LEXPRESS bus and has designated a site for a bus shelter near Building #300.
- Patriot Partners has asked that LEXPRESS modify bus Route #4 to allow buses to enter the project site. (LEXPRESS has not yet agreed to make this route change.)
- Patriot Partners deposited in escrow with the Town a sum of \$100,000. The Town has used these funds to:
 - Provide an additional operating subsidy for LEXPRESS
 - Support hiring a Transportation Coordinator for the Town.
 - Pursuit of a state (MORE) grant for the design and reconstruction of the Marrett Road/Spring Street intersection and for the design and construction of a sidewalk along Spring Street
- Patriot Partners has maintained commuter shuttle bus service between the project site and the Alewife MBTA station through membership in the 128 Business Council.
- Patriot Partners has been a member of the South Lexington Transportation Organization and has supported its ongoing activities to improve transportation in the area.

4.2 Future Traffic Mitigation Commitments

Pursuant to the 2003/2004 agreement Patriot Partners has future obligations independent of the current PSDUP amendment request. Specifically,

- Patriot Partners shall continue making annual \$20,000 (inflation adjusted) contributions to LEXPRESS (This payment would be reduced to \$10,000 if site occupancy drops below 180,000 square feet).
- Patriot Partners shall annually monitor site traffic generation and make an additional \$10,000 (inflation adjusted) contribution to LEXPRESS in any given year that trip generation targets are not met. Monitoring results shall be reported to the Planning Board, Town Planner and/or Town Transportation Coordinator. (Since the existing site trip generation includes a high percentage of construction related trips, the start of the monitoring program has been delayed. The start of the program will be negotiated with the Town based on anticipated future construction activity.)
- Upon traffic volumes at the site driveway meeting peak hour traffic signal warrants as defined in the Manual of Uniform Traffic Control Devices, Patriot Partners shall provide peak period police officer control at the main site driveway/Spring Street intersection.

4.3 Proposed Additional Traffic Mitigation

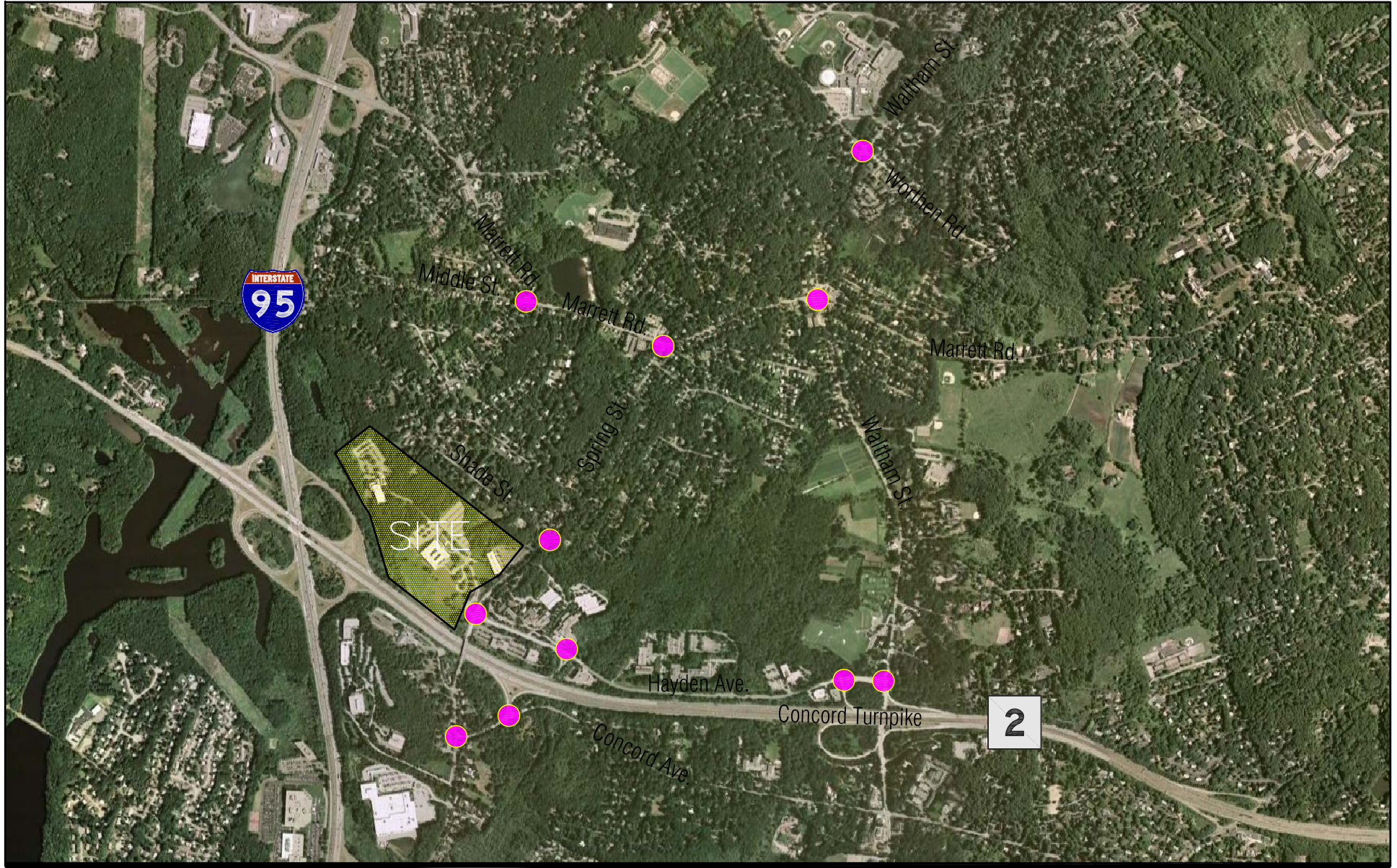
In consideration of the requested zoning change Patriot Partners will provide additional traffic mitigation to the Town. The additional mitigation commitments are defined in the attached Memorandum of Understanding between Patriot Partners and the Town (Appendix F).

The new mitigation commitments include funding for the Town's Traffic Mitigation Fund. Expenditures from this fund will be made at the sole discretion of the Town. However, based on the intersection level of service results and safety analysis presented in this traffic investigation, several improvements are offered for consideration as listed below in Table 11. More details regarding these improvements are provided in Appendix F.

Table 11 Potential Intersection Improvements

Location	Potential Action	Approximate Cost
Concord Ave/Rte 2 EB Ramp	Reassign priority to ramp. Install STOP sign on Concord Avenue	\$1,000
Concord Ave/Spring St	Install traffic signal. Channelize WB right turn lane.	\$300,000
Spring St/Hayden Ave/Patriot Way	Option 1: Install traffic signal.	\$250,000
	Option 2: Install traffic signal and construct SB right turn lane.	\$500,000
Marrett Rd/Spring St/Bridge St	Add EB right turn lane	\$300,000
Hayden Ave/Rte 2 WB Off Ramp	Install traffic signal.	\$250,000
Hayden Ave/Waltham St	Install traffic signal. Provide minor widening on Waltham Street to accommodate two through lanes in each direction.	\$600,000
Middle St/Marrett Rd	Option 1: Cut back vegetation to improve sight lines	\$2,500
	Option 2: Make Middle Street one-way eastbound east of Gary Street.	\$250,000

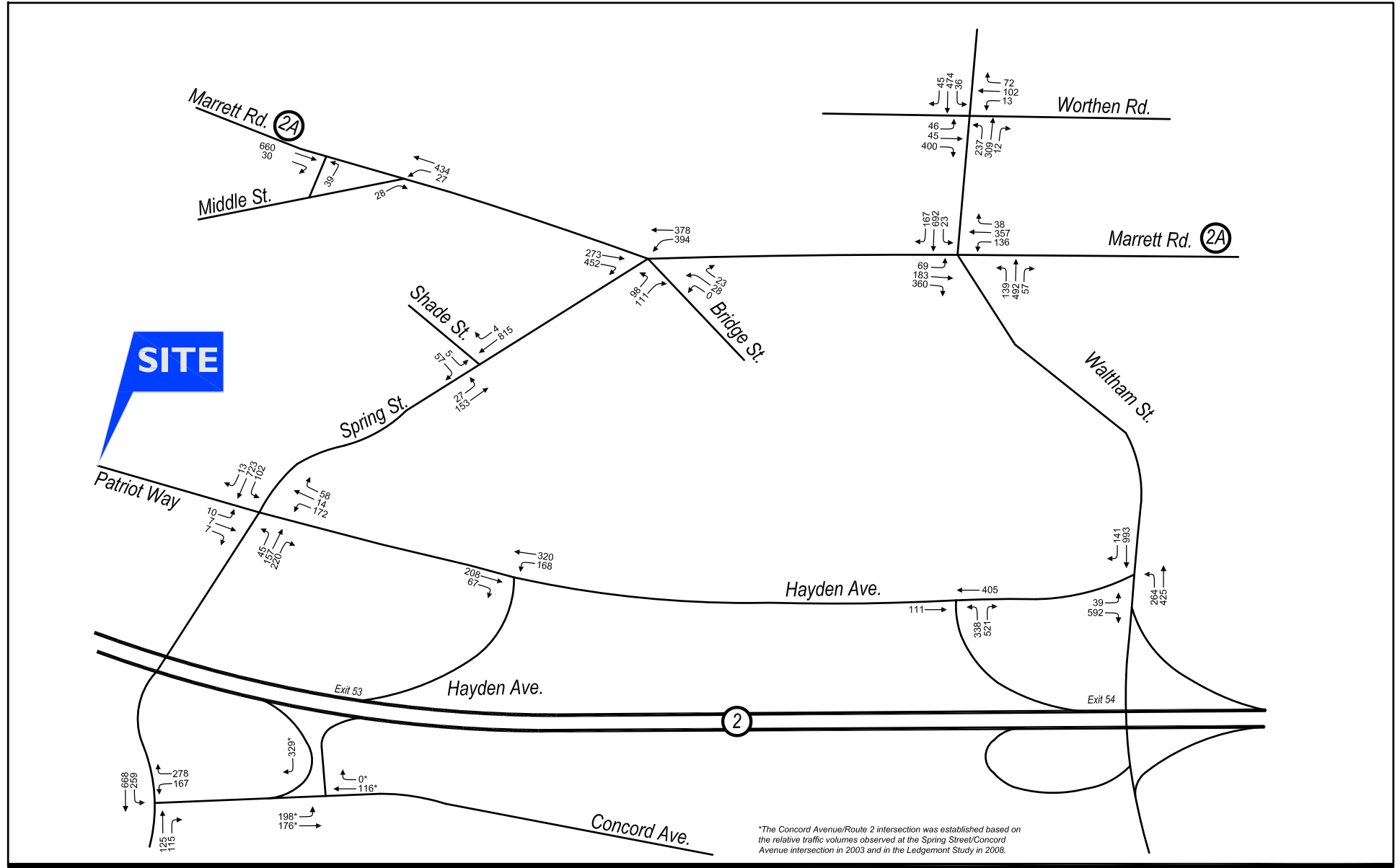
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Lexington Industrial Park,
Patriot Way, Lexington Massachusetts



Not to Scale



*The Concord Avenue/Route 2 intersection was established based on the relative traffic volumes observed at the Spring Street/Concord Avenue intersection in 2003 and in the Ledgemont Study in 2008.

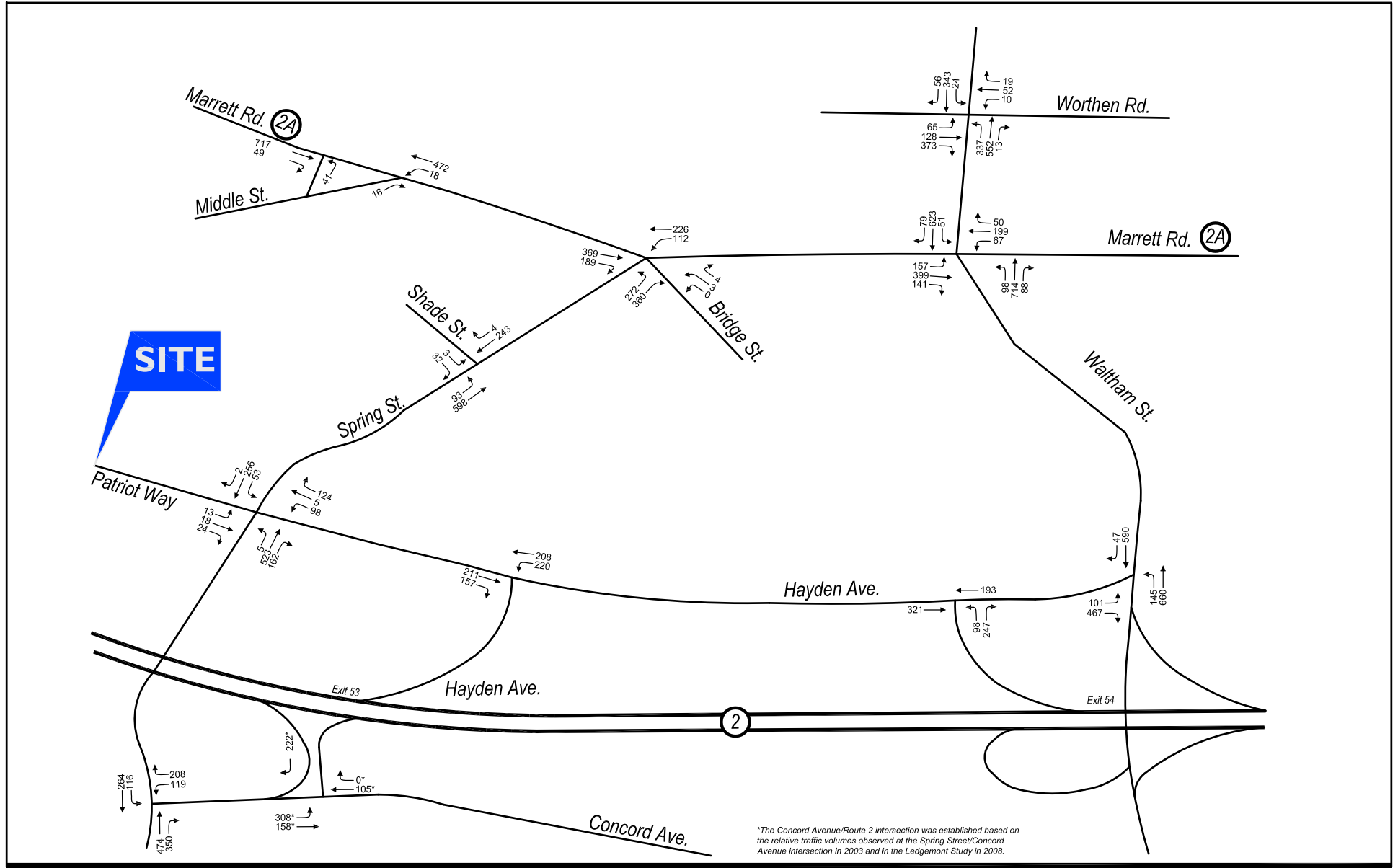


Not to Scale

Lexington Industrial Park,
Patriot Way, Lexington Massachusetts

Existing Morning Peak
Hour Traffic Volumes

Figure 2



*The Concord Avenue/Route 2 intersection was established based on the relative traffic volumes observed at the Spring Street/Concord Avenue intersection in 2003 and in the Ledgemont Study in 2008.

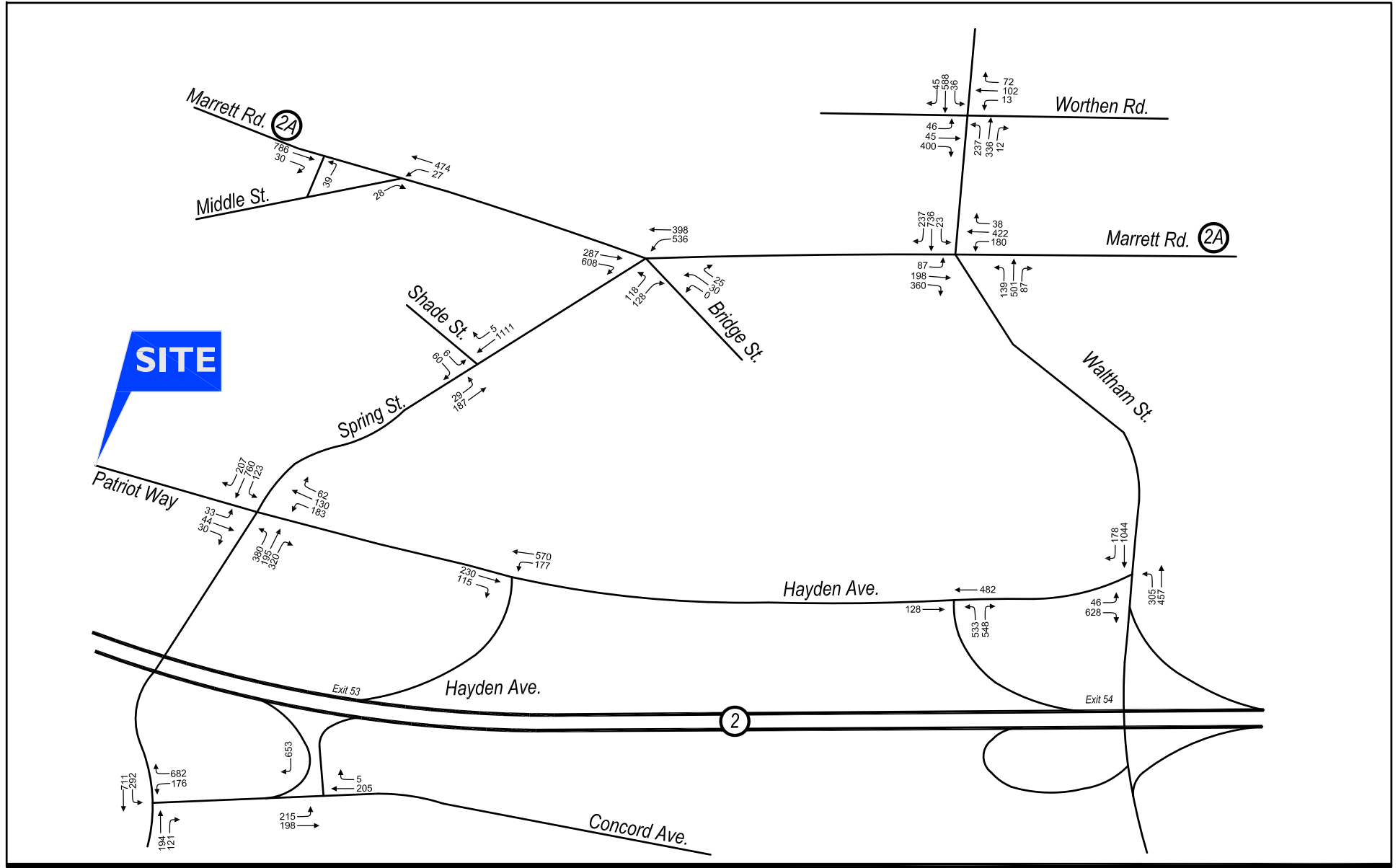


Not to Scale

Lexington Industrial Park,
Patriot Way, Lexington Massachusetts

Existing Afternoon Peak
Hour Traffic Volumes

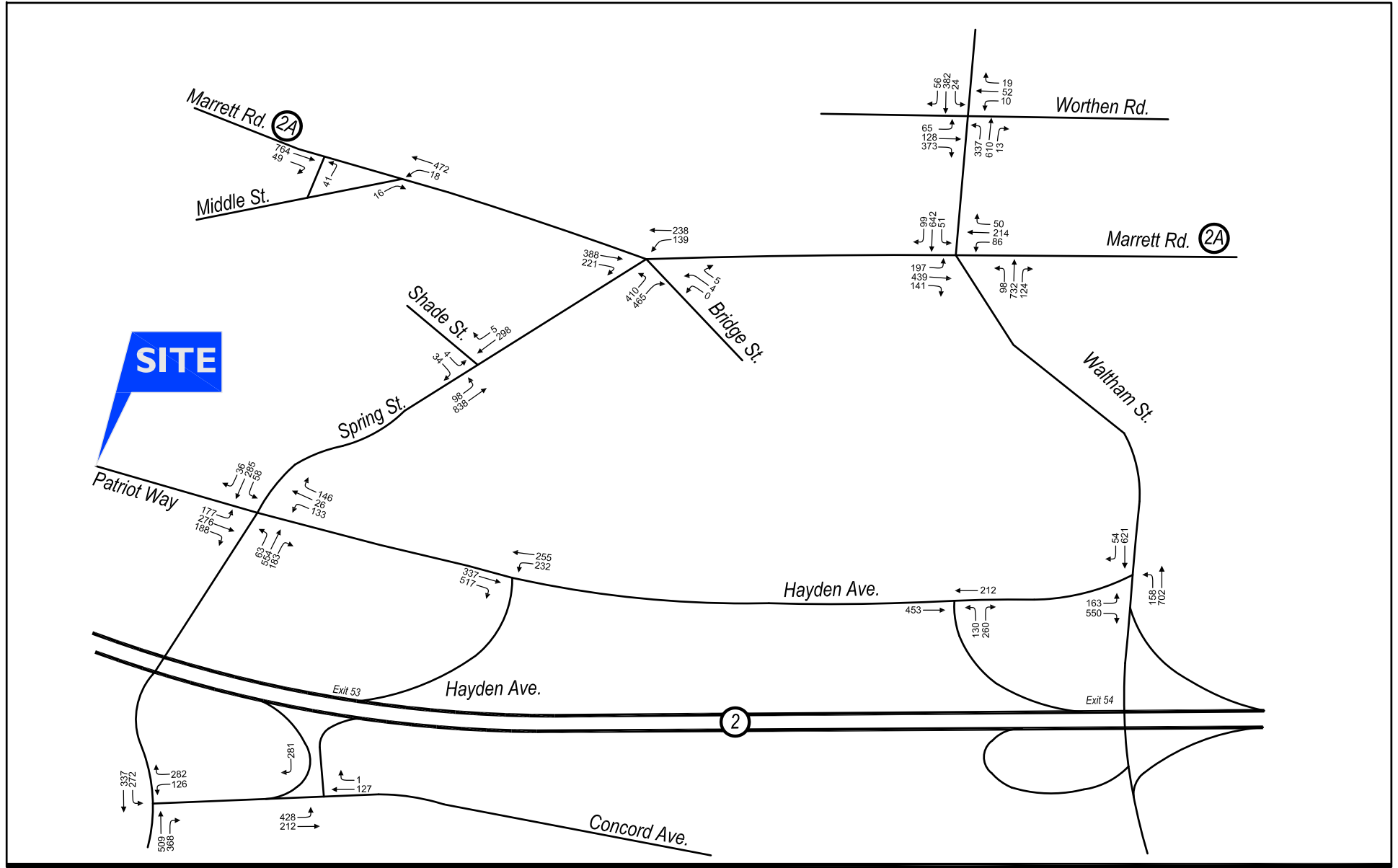
Figure 3



Not to Scale

Lexington Industrial Park,
Patriot Way, Lexington Massachusetts

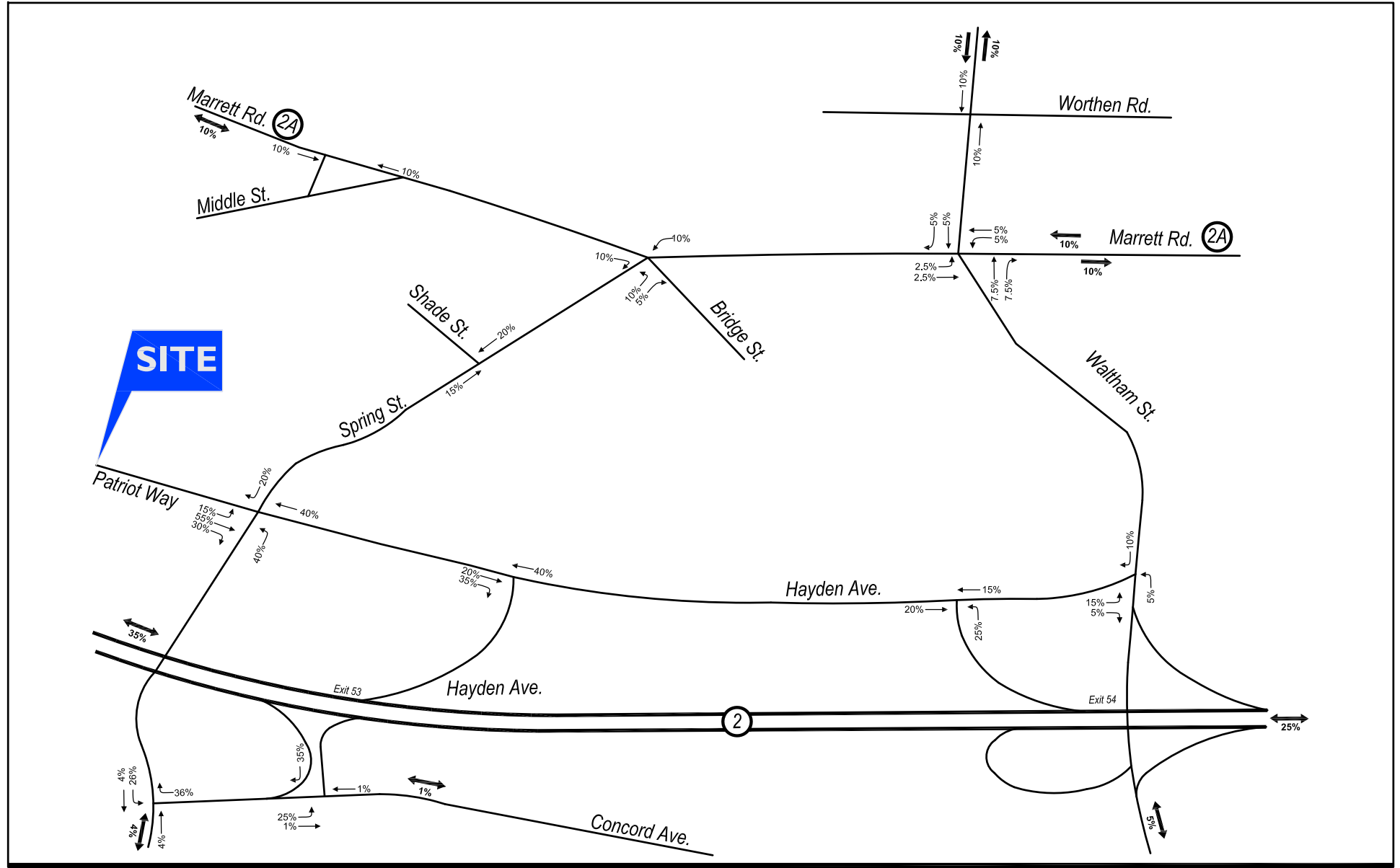
2014 No Build Morning
Peak Hour Traffic
Volumes



Not to Scale

Lexington Industrial Park,
Patriot Way, Lexington Massachusetts

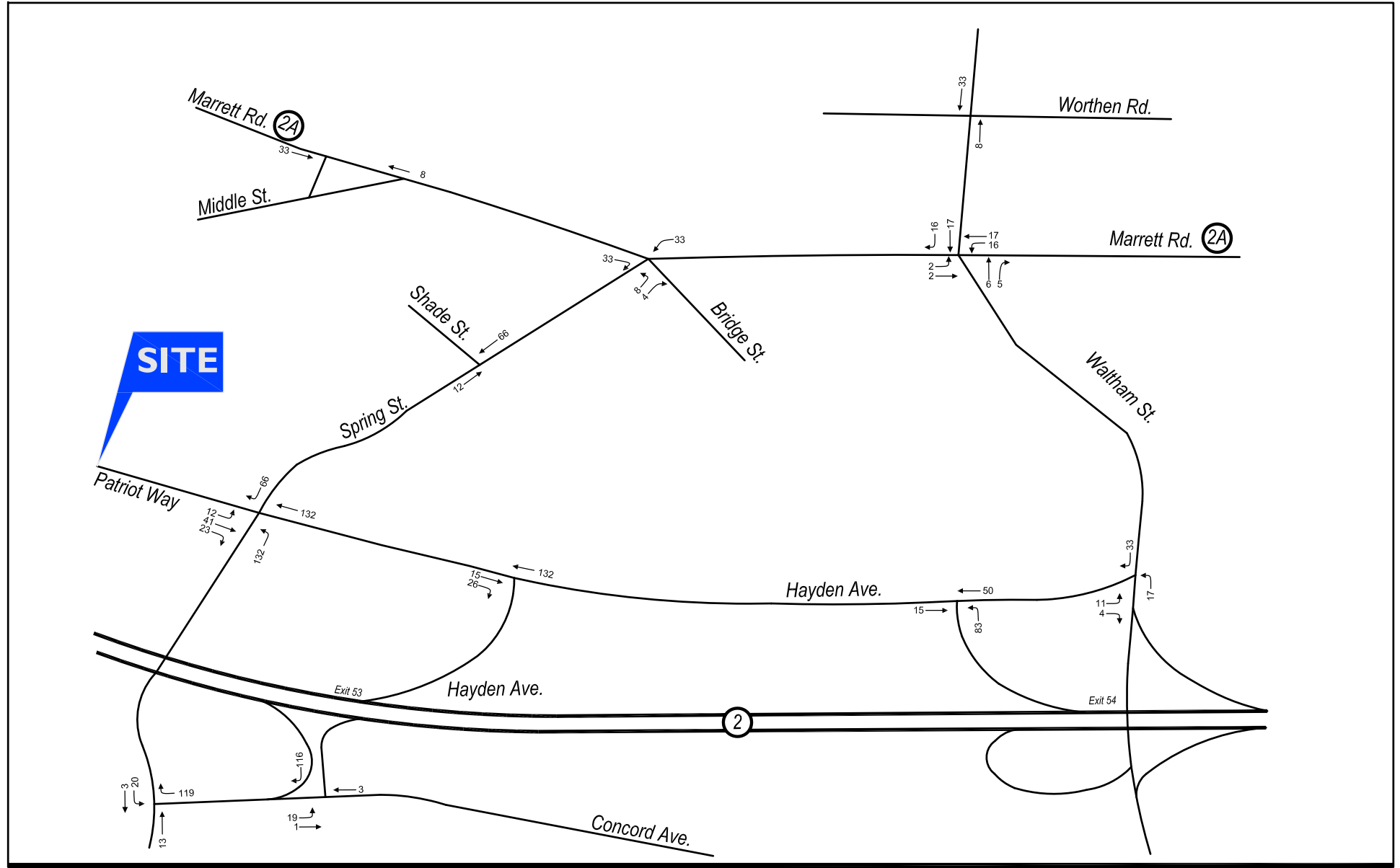
2014 No Build Afternoon
Peak Hour Traffic
Volumes



Lexington Industrial Park,
Patriot Way, Lexington Massachusetts



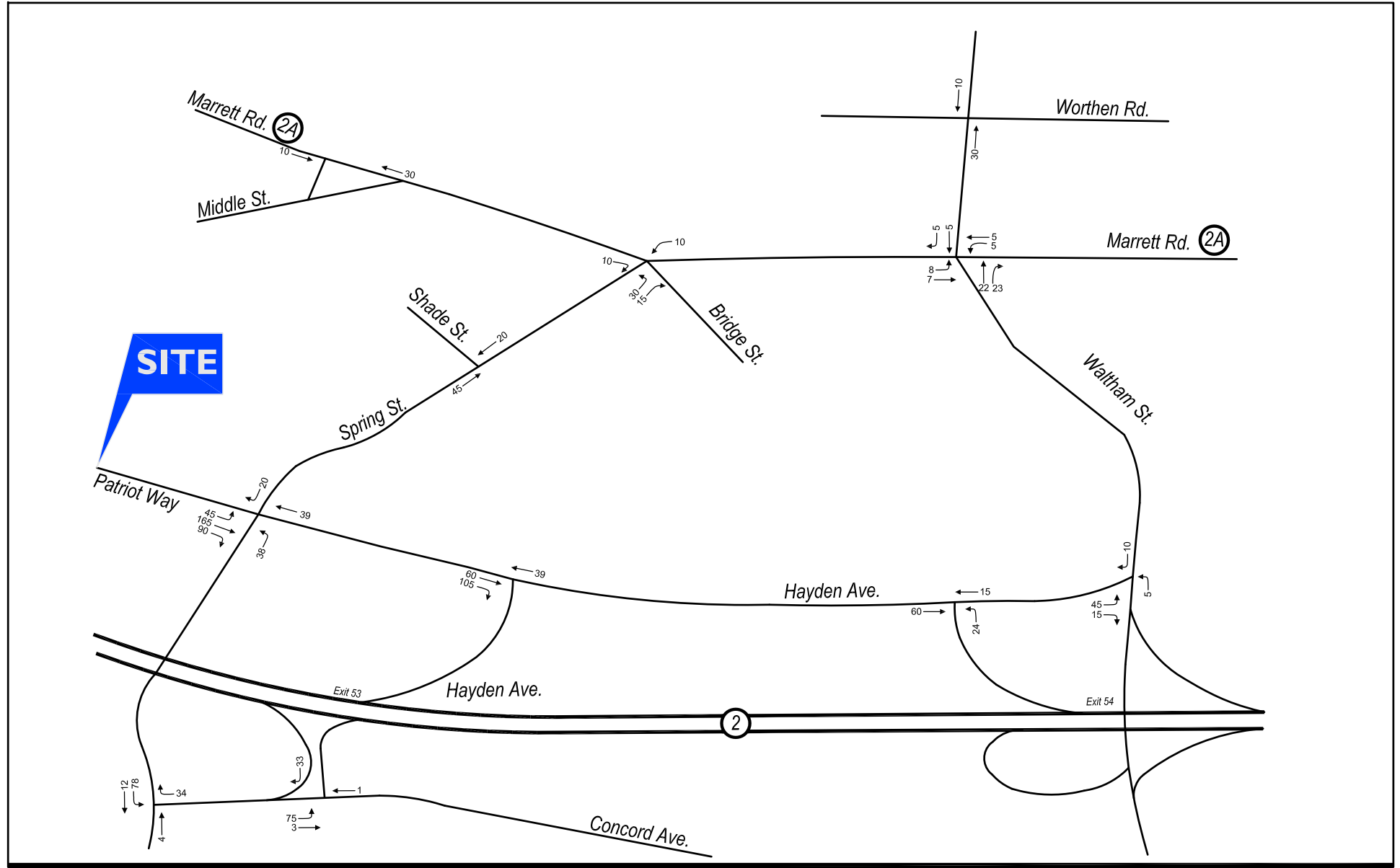
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Lexington Industrial Park,
Patriot Way, Lexington Massachusetts



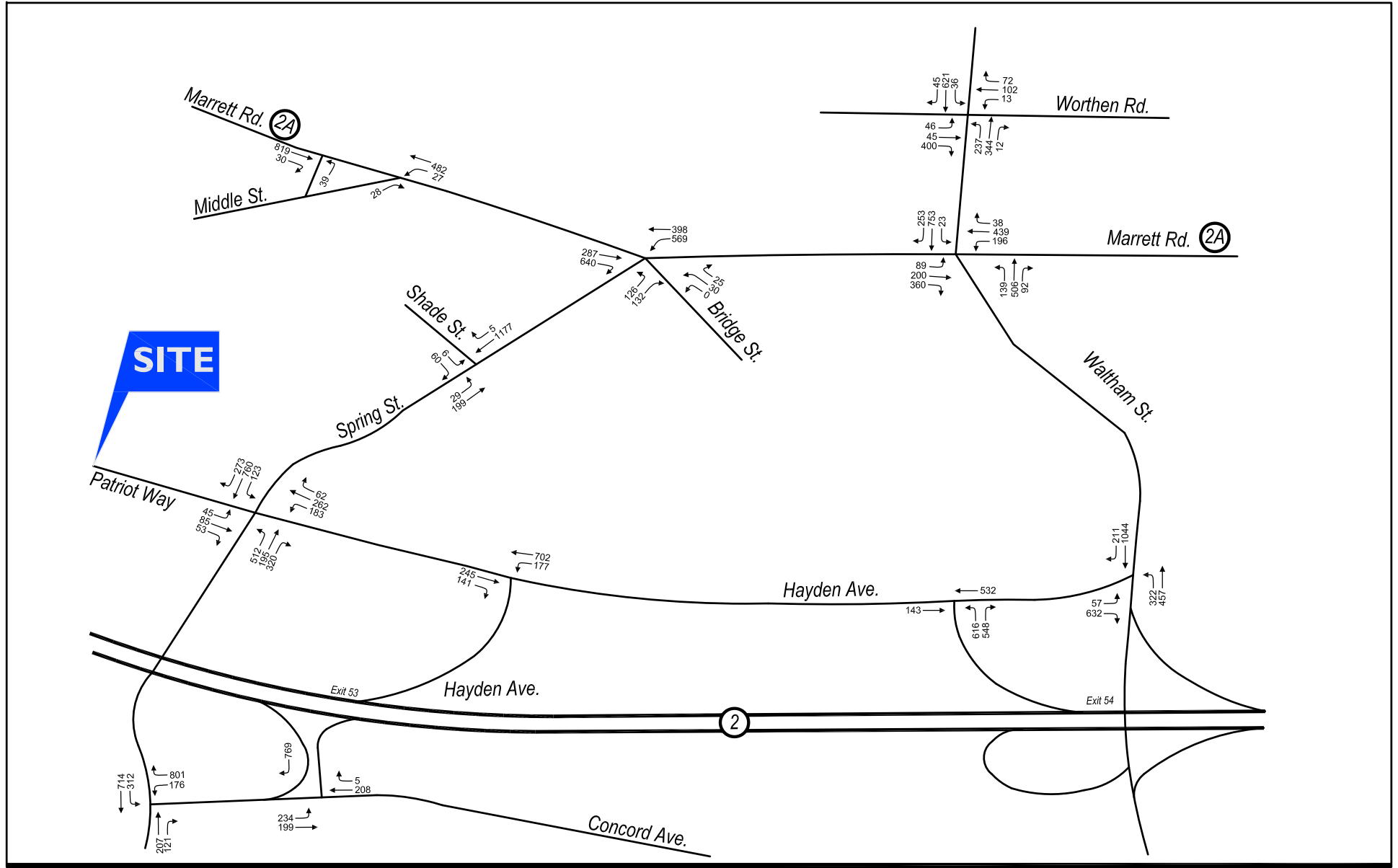
Not to Scale



Lexington Industrial Park,
Patriot Way, Lexington Massachusetts



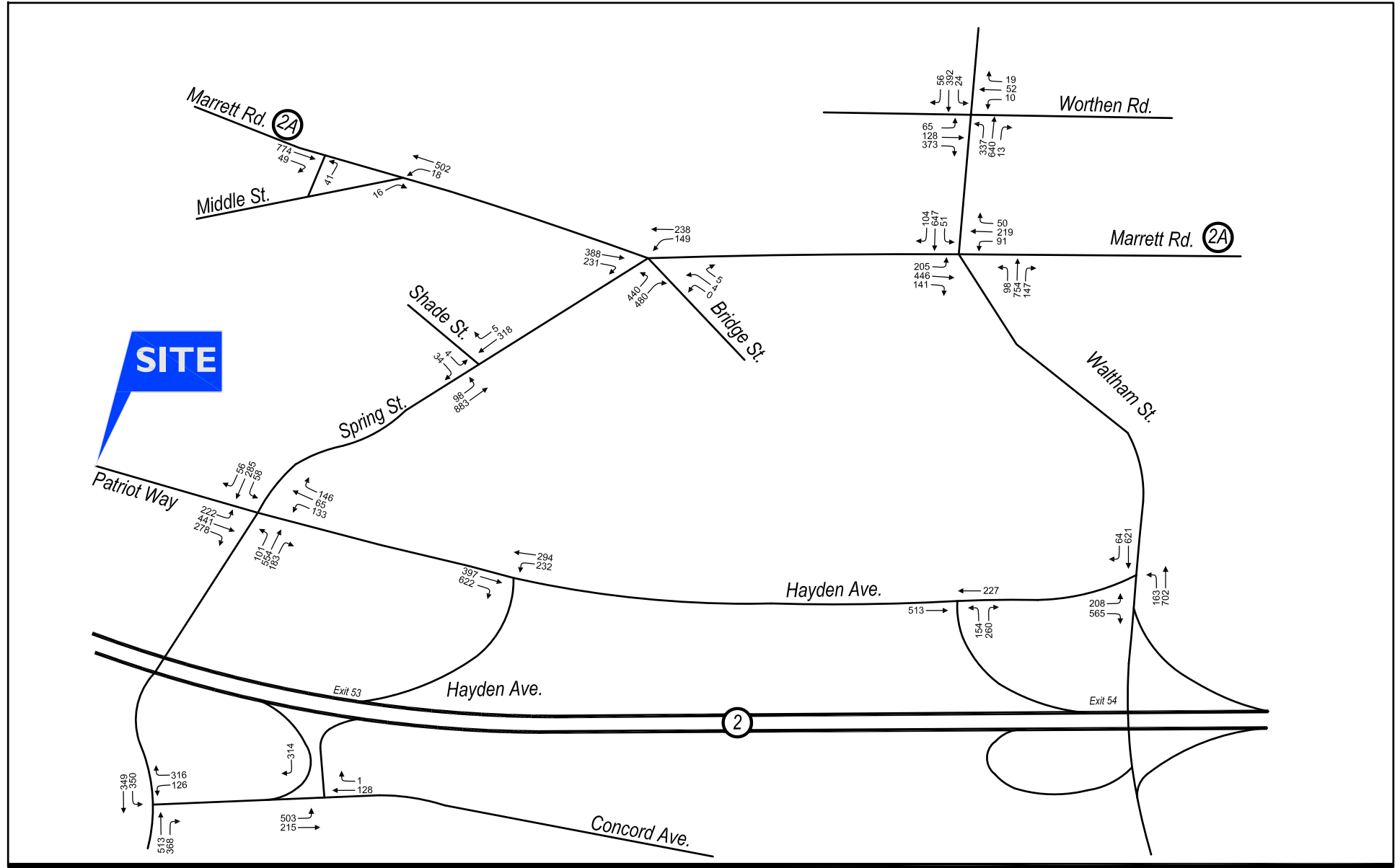
Not to Scale



Not to Scale

Lexington Industrial Park,
Patriot Way, Lexington Massachusetts

2014 Build Morning
Peak Hour Traffic
Volumes



Not to Scale